# Knowledge of fire

Building a fire is an example of using mathematics within the natural environment. Once the fire is sparked, the process involves using small twigs, building to larger sticks, then to branches. Estimating the correct size and sequencing builds the fire up rather than putting the fire out. In this example, mathematical concepts of size and sequence were daily practices for First Nations people.

First Nations fire management practices continue across Australia. The Gangalidda and Garawa peoples' Fire and Weed Project, supported by the Carpentaria Land Council Aboriginal Corporation (ACARA, 2019) applies Indigenous Knowledges of fire. This example uses mathematical practices in measurement, area, electronic mapping, financial literacy, monitoring and evaluation.

| Indigenous Knowledges | Connecting Indigenous Knowledges and Mathematics | Connections to the Australian Curriculum |
|---|---|---|
| Matt Burns (Quandamooka Traditional Custodian from North Stradbroke Island) shares his knowledge of traditional fire-starting methods. Matt uses the fire drill method, which uses a flat piece of wood as a base and a thin elongated stick as the 'drill stick'. He shows that by rubbing the drill stick between the palms of his hands, he creates friction between the stick and the base. This makes heat energy and ignites tinder material such as dry grass, or coconut fibre. The ignited material is then added to sticks and branches to make a fire. | **Share Indigenous Knowledge of creating fire using traditional methods of fire-starting**<br>Students:<br>• draw the order of events to start a fire<br>• represent making a campfire using traditional fire-starting methods as a series of events<br>• reflect on how well the sequence shows the fire-making process. | In Year 1, students describe the duration and sequence of events using years, months, weeks, days and hours (AC9M1M03).<br><br>In Year 3, students recognise and use the relationship between formal units of time including days, hours, minutes and seconds, to estimate and compare the duration of events (AC9M3M03). |
| Jason Smith (Palawa man from Lutruwita) shares knowledge of gathering wood for fires for keeping warm and cooking. | **Share Indigenous Knowledge about the use of fire**<br>Students:<br>– draw the different types and sizes of wood to collect for a campfire<br>– estimate the amount of firewood to cook a meal for 1, 2, 3 and 20 people, depending on the size of the gathering<br>– justify their estimates. | In Year 5, students use strategies to estimate numerical solutions to problems (including financial) involving rational numbers and percentages.<br><br>This could include estimation strategies to make decisions about traditional steam cooking in ground ovens, including:<br>• catering for different numbers of people<br>• resources needed for cooking (AC9M6N08). |
| Jason Smith (Palawa man from Lutruwita) shares his knowledge of fire and its use in land management practices on Palawa Country. He describes the approach of burning patches of land to form a mosaic pattern of areas. Jason shares his knowledge of firestick farming that is used to produce 'cool' fire. This is different to 'hot fire' from bushfires, which damages Country. | **Share Indigenous Knowledge about the use of fire in land management practices**<br>Students:<br>• draw ways to manage Country using fire and patterns of burning<br>• create patterns to show areas of burning and non-burning<br>• combine knowledge of the area of a rectangle and geometric patterns to map out a traditional approach to burning<br>• use a number line to show daytime temperature in degrees Celsius<br>• describe environmental factors such as wind and temperature that impact use of fire in land management<br>• reflect on their plan and justify their approach. | In Year 6, students:<br>• recognise and use combinations of transformations to make tessellations and other geometric patterns, using dynamic geometric software where appropriate (AC9M6SP03)<br>• establish the formula for the area of a rectangle and use it to solve practical problems (AC9M6M02)<br>• recognise situations (including financial) that use integers and locate and represent integers on a number line and as coordinates on the Cartesian plane (AC9M6N01). |

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| Jason Smith (Palawa man from Lutruwita) shares his knowledge on health of Country. He describes how cultural burning encourages healthy regrowth of native grasses. Some of these are edible. <br><br> Jason shares his knowledge of the poa grass (a low growing grass) and lomandra grass distribution. <br><br> Firestick farming uses cool fire only on ground cover or low-lying debris. Cool fire does not travel up tree trunks to branches, which makes hotter fires by burning more fuel. This is the difference between cool burning as land management and bushfires which may burn out of control. | **Share Indigenous Knowledge about the use of fire in land management practices and the effects on regrowth of native grasses** <br> Students: <br> • draw the distribution of grasses of a small patch of land shown by Jason <br> • use the drawing to describe the health of Country. <br><br> Students also: <br> • select an area of local land to study and measure the health of Country <br> • in small groups, use a hula hoop or similar-sized object to randomly sample parts of the area <br> • gather data and use mathematical modelling to show how to improve the health of Country <br> • as a class, reflect on the different models shared by each group. | In Year 7, students use mathematical modelling to: <br> • solve practical problems (including financial) involving rational numbers and percentages <br> • formulate problems, choosing representations and efficient calculation strategies, using digital tools <br> • interpret and communicate solutions in terms of the situation, justifying their choices (AC9M7N09). <br><br> In Year 8, compare variations in distributions and proportions from random samples of the same size from a population and recognise the effect of sample size on this variation (AC9M8ST03). |
| Jason Smith (Palawa man from Lutruwita) shares his knowledge of fire and its use in land management practices on Palawa Country. He describes burning patches of land to form a mosaic pattern of areas. He explains that this type of burning reduces fuel and encourages new growth to lure grazing animals for hunting. <br><br> Jason describes impact on fire height and fire behaviour depending on slope height, fuel types and weather conditions. He explains cool fire and its importance to sustain and heal Country, and how they go out by themselves (self-extinguishing fires). | **Share Indigenous Knowledge about the use of fire in land management practices** <br> Students: <br> • list and draw the different factors that affect fire behaviour <br> • use mathematical modelling to investigate the rate of fire spread under different weather conditions, fuel types and changes in landscape <br> • communicate their findings <br> • reflect on their modelling to explain the rate of fire spread. | In Year 8, students recognise and use rates to solve problems when comparing 2 related quantities of different units of measure. This could include investigating First Nations land management, such as: <br> • the application of the rate of fire spread under different environmental conditions such as fuel types, wind speed, temperature and relative humidity <br> • First Nations peoples' conservation of water by estimating rates of water evaporation based on surface area and climatic conditions (AC9M8M05). <br><br> In Year 9, students use mathematical modelling to: <br> • solve practical problems (including financial) involving direct proportion, rates, ratio and scale <br> • formulate the problems and interpret solutions in terms of the situation <br> • evaluate the model and report methods and findings. <br><br> This can include exploring fire techniques in First Nations land management practices that use proportion relationships, including the rate of fire spread in different fuel types to wind speed, temperature and relative humidity (AC9M9M05). |